THE . . . QUESTION MARK

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THE QUESTION MARK

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We hope, by the policy to which this periodical is dedicated, to interest our readers in the broader aspects and philosophies of science and to promote a greater feeling of amity between the undergraduate and the alumnus.

In the issue of November 1936

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EDITORIAL

"Science must repudiate the methods of cultivated barbarism manifested in modern warfare."

—SIR RICHARD GREGORY

The commemoration of the signing of the Armistice in 1918 causes us to turn our thoughts to those men who gave their lives in the last war and to the possibilities of future war. It is generally admitted that few persons, if any, really desire war, and yet we see certain nations arming themselves to the teeth and, if not for war, then for what? Even now, in Spain there is raging a bloody civil war.

The last war was fought by machines — enormous guns, tanks, submarines and other such instruments being used, men being necessary merely to run the machines and be killed. This is a somewhat exaggerated view but, in future wars, poison gas and machinery will play a part of ever-increasing importance.

Consider who it is that makes possible these machines and these poison gases. Is it not in every case the scientist who invents new machines, new guns that can project a shell farther than the last, new and more horrible poison gases, better bombs, and incendiary bombs which could set a city on fire in a very short time? This query must be answered in the affirmative. Yet, we cannot say that scientists are more bloodthirsty than other people. What, then, is the reason for producing these agents of destruction?

The true scientist is a seeker after truth — he wishes to learn about nature — he seeks the explanation of why things act on each other as they do. If he finds that several things act on each other to produce a poison gas, very interesting, but he has no desire to spread the gas around and annihilate a city. If he finds that he can build some engine of destruction that will perform mighty feats, well and good, but he does not direct it to destroying property. Why, then, are such discoveries directed into the field of destruction?

Certain leaders of men become imbued with a desire to conquer, and they come to the scientist and get him to produce war materials. He does so either because he is under compulsion or because he is offered a rich reward. In many places today there are more opportunities of employment for chemists under the war department than in ordinary industrial activity. Thus the chemist, faced with the problem of earning a living, is forced to devote his energies to the discovery and production of war materials instead of advancing the knowledge of Science along more useful lines. The Scientist produces the means of destruction but gives no consideration to whom they shall be entrusted.

It would appear, then, that Science should concern itself with the ends for which scientific discoveries shall be used and to whom these discoveries should be entrusted. We find that a great many scientists bury themselves in their work and pay little attention to what goes on about them in this ever-changing world of ours. It is rare, indeed, that we hear of a man of science being elected to Parliament to assist in the government of the country. May we hope that in the future Science will study the problems of mankind and take an active part in the leadership of men. By the application of scientific thought to the problems of our day it seems likely that an intelligent leadership could be provided.

In the words of Sir A. Daniel Hall:— "Science means power, but science has given no consideration to whom that power should be entrusted, and to what end it should be used."

We, the Science students of today are the scientists of tomorrow. Let us take heed of these words and do all in our power to remedy this state of affairs.

Senior Stick's Message.

LET me again convey a welcome to all new members of the Science Students' Association. I hope that during the coming session you will take part in the activities of your organization. We have, as you know no doubt, every kind of activity of interest to a student body.

In athletics we have just concluded a successful rugby season, and a successful soccer season is almost complete. If you missed the opportunity of getting into these activities, remember that hockey, basketball, swimming and curling are still to come. As for curling, you don't require any experience to come out and curl on Saturday mornings. This is held at one of the rinks in the city. The location and dates will be announced soon. Remember that a large portion of the curling cost is carried by your association. If you are interested in any of these coming athletic activities be sure and come out to practices when they are announced and you will be welcomed. We need your support in order to produce winning teams.

Many students, no doubt, will not be able to take part in athletics, but the majority of you will be able to attend the social activities which are conducted during the year. Our first social event of the year was the Freshmen's Reception in which we combined with other faculties of the U.M.S.U. This proved to be a very successful affair, both socially and financially. The first General Meeting of the Association was held on Oct. 28th, where the budget for the year was presented and adopted. The next meeting will be in the form of a dinner-dance to be held on Nov. 26th. More than half the cost of this event will be carried by your organization. Every student should take advantage of this and come out and make this event a big success. Detailed information will be announced by the Social Committee Chairman. Then there are the activities of the Ladies' Club and the Men's Club with events soon to be announced.

The chairman of Dramatics, and the chairman of Debating are anxious to hear from anyone interested and wishing to take part in dramatics and debating. If you do not know these men get in touch with your year rep. of that activity or the president of your year.

Here is the event in which every Science Student must do his part — at the last meeting of the Council it was decided that this year we would again promote another "Science Week." The tentative dates are set at Saturday, January 30th to Friday, February 5th. It will take nearly the same form as last year with some changes. The main event will be a large industrial exhibition along with an exhibit from each department of the Science Faculty. This exhibition will be held as last year in the Hudson Bay store. All students willing to help in the initial arrangements will please give their names to their year President. The work will consist of either making business calls or preparing material to be exhibited. We rely on you to boost this undertaking and to make this event a success.

I would like to congratulate the Editor and staff on the first edition of the Question Mark. This magazine is published three times during the session. If this issue does not meet with your approval, your criticism and suggestions for improvement will be appreciated. This is your magazine and your contribution to it are essential to make it a success.

The success of the Science Students' Association depends on your co-operation, so come out and support our activities and cheer on our teams.

DONALD M. YOUNG
Senior Stick

Note:. A list of the officers of the Science Students' Association will be found on page 18

The Scientific Society.

RICHARD V. HEINZELMANN, President

OUT of the dark and mysterious past the Scientific Society has grown and expanded, till it now proudly upholds its responsible position as the oldest of our Science organizations. Although it has had its depressions and its prosperous times, it has become known for the worthwhile entertainment that it offers.

I am very glad of this opportunity of indicating the reasons why it should receive your full support, and I would like to address the following remarks to the freshmen in particular. In the first place, it is an official organization of the Science Students' Association, maintained by your student organization fees. Now there has always been, for some reason, a sort of traditional fear of this Society, a sort of feeling on the part of the freshmen that it is not for them at all. They picture graduates and scientific experts listening to technical talks which are entirely over the heads of the poor undergraduates. Nothing could be more untrue! I would like to emphasize that the organization is conducted by the students, and is planned especially for the students of the Junior Division, although no Senior need consider himself so learned that he could not also be entertained. If it does nothing else, it will teach you to do your thinking a little more scientifically. I remember one instance which occurred during the Science Week Exhibition last January, where a little scientific thought would not have hurt one middle aged man who was taking in the sights. He stopped in front of the Zoology display, where there were a series of glass cases showing the development of the egg, at two day intervals, from the time it was laid till it had hatched. The gentleman listened with apparent interest to what the fair attendant had to say concerning the specimens, and then. scratching his head, asked, "Say, those aren't all the same chicken, are they?"

In the past the custom has been to hold a series of talks by interesting speakers, both from the University faculty and from without. This year, we are trying to inaugurate a slightly different system, which I feel will be even more interesting for the students of Science. It is planned to devote several of the meetings to scientific movies, which have been procured from leading industrial firms throughout the country. We hope to finish the evening with an informal dance in Theatre C, with the possible assistance of the social committee. Such meetings will be occasionally interspersed with interesting lectures. A few of the movies already procured are: " Beyond the Microscope," showing what molecules would probably look like if they could be seen, "Power," "The Wonders of the X-Ray," "The Miracle of the Locomotive," "Liquid Air," and many related to natural science.

As I have already intimated, the humble origin of the Scientific Society is extremely obscure. Perhaps someone among the graduates reading this article may be able to throw light on the subject. Several years ago, when Mr. Ronald Stewart-Hay became Secretary-Treasurer, he was "put into posession of some seven dollars in cash and an old account book, the latter running back some four or five years only, and entirely without authorizations or signatures of any kind." When he became President, he, with the combined help and opposition of his executive, drew up a constitution. Two years ago, the Society became officially recognized by the Science Students' Association, and its President was given a seat on the Science Council, with all the privileges allowed the other members. Thus we find the Society today.

Let us hope that the support of the entire student body will enable the Scientific Society to become the best, as well as the oldest of all our student clubs. I would greatly appreciate comments on those meetings which we have already had, with suggestions for improvements in those yet to come. I suggest that you watch the bulletin boards for notices of meetings, and I again invite all Science students, especially freshmen, not to miss these worthwhile and entertaining evenings.

(Editor's Note.—This is the first of a series of articles on Campus Clubs related to Science. The Camera Club will be described in the January issue. The third club has not yet been selected.)

But Why Science?

"ZOOLOGICUS"

"He treated me and told me that the country needed men." Old English Ballad.

THERE is in many medical colleges what may be called an old Hippocratic custom of submitting to each aspiring sawbones a lengthy questionnaire. Among the many questions in this soul-searching document, one question concerns the reasons why the wretched youth desires to take up the noble profession of Healing.

The correct answer, of course, that is expected and that is usually given, is: "Desire to be of service to Humanity." The really wise guy, wishing to quadruple his chances of admission, will add: "influenced by strong admiration for local doctor who saved grannie's life." The coarse-fibred fellow who confesses that he is inflamed by unholy curiosity, or by the desire to make easy money, may inspire a certain amount of eyebrow-levitation among members of the selection committee.

It seems to me a very fortunate thing that no such reasons are demanded of the aspiring scientist. He could scarcely—in these days of poison gas in warfare and in advertising — claim that he wished to be of service to suffering mankind: or that he was influenced by the example of his local science teacher, for what honest teacher would thus hang the millstone round his own neck; and if he said he wished to make easy money he would immediately stamp himself as a fool.

It is usual of course in biographical or obituary notices of deceased scientists to insert something like this: "From earliest infancy the boy showed himself to be the father of the man, displaying a keen interest in all natural phenomena, constantly worrying his fond parents with questioning eagerness as to what has the tortoise taught us, or what noisy noise annoys an oyster . . .", when actually the truth should read: '.Having shown from infancy a moronic fascination for smashing glassware, and being much given to hanging round drugstores in the hope of receiving a free handout of licorice, his parents decided that Bob had the makings of a chemist," or: "Having been initiated at an early age, by an old man who should have known better, into the vice of moth-treacling, the unfortunate boy fell a ready victim to the infamous advice of a Dean of Science, and decided to become a biologist."

Personally, after I had outgrown my childish ambition to be the driver of the 5.30 express, I rather fancied myself as a Harley Street surgeon, eventually knighted, and even possibly baronetted, by His Majesty for saving the lives of untold humanity—and, incidentally, making a jolly good thing financially out of life-saving—, but after being thoroughly frightened from a medical career by a Dean of Medicine with lurid and bloodcurdling stories of famine-stricken doctors, and having been frightened from a chemical career by a Professor of Chemistry with horrent and harrowing tales of the thousands of qualified chemists peddling soap at house-doors, I found myself on my first day in college standing outside a door labelled "Beyer Professor of Zoology" and eventually found myself facing a tall, shaggybrowed man who, after repressing a violent start at meeting an aspiring zoologist who had never learned the art of moth-treacling, said in stern fashion: "Well, young man, if you really wish to be a zoologist you must be prepared to tighten up your belt a notch or two; my advice to you is to specialize in some group of animals that you can eat if necessary." And with that he took me to an ancient man and said: "Start this fellow beetle catching." And so I became a zoologist.

What, without asking, hither hurried whence?
And without asking, whither hurried hence.
Another and another cup to drown
The Memory of this Impertinence.

It is my considered opinion that many and many a scientific man has been pitchforked into his ultimate means of livelihood as casually as the man who:

When the Sergeant-Major came to him and cried,
However did you come to be a soldier, he replied
I was standing at corner of the street.

Well, what of it. We all have our secret, ungratified ambitions. I know at least one eminent banker whom I expect to hear any day has thrown up a financial career to embark upon large scale breeding of these aptly named creatures, the lovebirds, although I must add that whilst bankers as a class seem peculiarly addicted to hobbies of a zoological nature, I have yet to hear of a banker who gratifies a secret ambition towards medicine by feeling his customers pulses or stroking their warts, or who gratifies a morbid desire for chemistry by exploding stink bombs in the Board Room.

If there really exist men who deliberately chose a scientific career from childhood days and rumour has it that such men are to be found, it must be that they are sufferers from a Freudian inhibition. They are men who were never allowed by fond parents to play with toys and who have grown up seeking an outlet for their suppressed desires. For what is a modern laboratory, after all, but an elaborate nursery of expensive and glittering playthings?

Amateur Radio.

E. HOWARD MEDD

AN amateur radio operator is a person whose hobby is the operation of a private radio station under the condition that no remuneration may be accepted for any services performed by it. A license to operate such a station is obtained by passing a test conducted in Canada by the Department of Marine, a branch of which is located in Winnipeg. In this test the candidate is asked to explain, with the aid of a diagram, the circuit of the transmitter he intends to use, and must satisfy the examiner that he is familiar with the adjustment and care of all the equipment in his station. He must pass a test in sending and receiving using the Continental code, at a speed of not less than ten words per minute. A knowledge of the regulations governing radio communication in Canada is also required.

The greatest stumbling block to the beginner is the code test. The best way to learn is to find another would-be amateur, build a code-practice set and use it every day. There are volunteer code practice stations in operation on the amateur bands which send transmissions especially calculated to aid beginners.

Early radio experimenting, both amateur and commercial, was done with spark-transmitters, the wave-length used ranging from five-hundred to five thousand metres. In 1912 the United States Government, prompted by commercial radio interests, limited amateur transmissions in that country to wave-lengths under two hundred metres, as that part of the radio spectrum was considered useless. The amateurs developed these short waves so successfully that the different nations reassigned the spectrum below two hundred metres, and today the poor amateurs are confined to seven bands, each only a few metres wide. These bands are known as the 160, 80, 40, 20, 10, 5 and 2½ metre bands.

The equipment of an active station must include a short wave receiver, a transmitter and a monitor. Receivers range from simple "home-grown" sets, costing no more than five dollars,

to commercial sets with all the trimmings, worth as much as three hundred dollars. The majority of amateur reecivers are homemade. The author used to tune in an English broadcasting station on 20 metres every night during the Olympic games, to hear a summary of the games. The receiver used was a simple battery set using three tubes. Transmitters are usually worth more than receivers, although a "flea-power" transmitter can be built for as little as five dollars. Its range however, would be small. probably no more than three hundred miles on 80 metres. The monitor is a device used to check the frequency of the radiated signal, in order to ensure operation within one of the allotted amateur bands. The frequency of the signal is usually fixed by means of a thin piece of quartz crystal placed in the transmitter circuit, which is said to be crystal controlled.

Both the receiver and the transmitter must have a high voltage supply for the tube plates, as well as a low voltage supply for the tube filaments. Where alternating current is available a power pack containing high voltage transformers and rectifier tubes is used to step up the a.c. voltage and change it to direct current. Transmitter plate voltages range from 250 volts to 3,000 volts. One amateur, investigating a smokescreen from his transmitter, found that his pet cat had curled around the warm amplifier tube and shorted the high voltage to the tube. Nine lives were not enough to bring the cat through that ordeal. Several amateurs have been killed through contact with high voltage power supplies.

Where no a.c. is available, B batteries or motor-generators are used as high voltage sources. A motor-generator is driven by a six or twelve volt storage battery, and deliver 200 to 500 volts d.c. at low current. Vibrator power supplies (a form of induction coil) have been used with success as a source of B voltage.

Before building his transmitter the amateur must determine the band on which he is going to work, as one transmitter will not cover all the bands. The choice of bands is governed by the nature of the amateur's work. For medium distance work 80 metres is used; 20 metres is the best long distance band; 5 metres is the best band at present for experimental work. Transmitter circuits may be so designed that an outfit controlled by an 80 metre crystal may be made to "double" into 40 metres by tuning the circuit to operate on the second harmonic.

An 80 metre station contacts only stations on 80 metres. If the operator wishes to work 40 metre stations he must change his transmitter to radiate on 40 metres.

A candidate who is successful in passing the test mentioned at the beginning of this article is granted his license and call letters. By international agreement, Canadian amateur calls are prefixed by the letters VE, United States calls by W, Australian amateur calls by VK, and so on. Canada is divided into five divisions, namely the Maritime Division VE1, Quebec Division VE2, Ontario Division VE3, Prairie Division VE4 and Vanalta Division VE5. The author's call is VE4ZA. The advantage of this system of division is that it enables the listener to tell the approximate location of any station which is sending its call letters.

The reader may have heard amateur phone stations calling as follows:—"Hello CQ, Hello CQ, VE4XXX calling CQ." This general inquiry call CQ is used as an invitation to any station on the same band to call back. The procedure used by a code station is as follows:— "CQ CQ CQ DE VE4ZA VE4ZA" is sent by the transmitter for perhaps a minute. The operator then stops sending, switches on his receiver, and slowly covers the amateur band looking for answers to his eall. If VE4ZZZ wished to reply he would send as follows:— "VE4ZA VE4ZA VE4ZA DE VE4ZZZ VE4ZZZ." When two stations are "hooked up," the receiver of each is left tuned to the transmitter of the other. Most operators avoid the above "hide-and-seek" method of contact by arranging regular schedules with other amateurs.

Words are sent as dots and dashes formed by a hand key. Many experienced operators use a faster type of key known as a semi-automatic key or "bug," which makes the dots automatically and which, by the way, costs about four times as much as an ordinary key. Operators with two years experience have their licenses endorsed for radio-telephone transmission. A phone rig involves more expensive equipment, but the phone man with no key to pound can lean back and operate with his feet on the table.

In order to speed up telegraph transmission, a system of abbreviations has been developed, which is used by commercial as well as amateur operators. For example, the abbreviations QRK QRU? QRV AR K mean "Your signals are good; have you any messages for me? I am ready; end of transmission; go ahead." There

are pages of these Q-code abbreviations which have been adopted by the International Radiotelegraph Convention. An amateur or "ham" using code transmission may say that he "had a vy fb qso wid a VE3" that is he "had a very fine (fine business) conversation with an Ontario amateur." The word transmitter is shortened to xmtr, schedule to sked, the girl friend to "the yl" (young lady.) A ham speaks of his wife as the "xyl" or the "ow." The standard ending of a conversation (or ragchew) is "73 ob es cul" meaning "best regards old boy and see you later."

There are at least five classes of amateurs. The first class is composed of beginners, who usually operate low power rigs.

The second type is the "ragchewer," or the social lion of the amateurs, whose chief joy is to hold regular conversations with other amateurs. Two hams may speak to each other for years, and may become good friends, without having seen each other. Their conversations range from the latest wrinkles in transmitter equipment to the latest weather reports. Incidentally, there is a heavy fine for using profane language over the air. The author once heard a Manitoba ham say "I must sign off now because the family wants to hear the hockey broadcast, and I have most of the receiver tubes in the transmitter."

Then there is the long distance fiend (or DX-er) who is interested primarily in contacting foreign stations such as Australia, Japan, England, and so on. This DX work is done on low wave lengths, particularly 20 metres. There are amateurs in Winnipeg who have worked every continent.

The handling of radio messages has developed the "traffic hound" amateur. This message handling is supervised by the American Radio Relay League, which has established a network of relay stations throughout Canada and the United States. Messages must not be of a commercial nature. Delivery is not guaranteed as no charge can be made for sending a message. The relay stations operate on regular schedules every night. The Winnipeg trunk line manager often handles 200 messages a month. One winter night the author heard a traffic hound operating in a "shack" with no stove. He had to keep his mitts on except when he was pounding the key.

Amateurs who like experimenting have lots of scope, especially on 10, 5, and 2½ metres. 5 metre work is being done here in Winnipeg.

During many storm and flood emergencies, amateur radio has been the principal, or the only means of outside communication. Valuable work was done last spring during the floods in the United States. Amateurs prepare thoroughly for emergency rescue work. It is interesting to know that Red Cross centres throughout the United States are furnished with lists of amateur stations in their vicinity, as a regular part of their emergency program.

There are more than 50,000 licensed amateurs in the world today. The great majority of these are in North America, but Australia, New Zealand, Japan and Great Britain are well represented. Certain European nations (Italy, for example) do not license amateurs, while other nations discourage amateurs by piling on unnecessary restrictions. Radio waves are not stopped by international boundaries, however, and the contact which amateur radio provides between the youth of different nations, may be an influential factor in the future in the preservation of world peace.

Ichthyology
The Study of Fishes.

DAVID HINKS

ICHTHYOLOGY, that branch of Zoology, which treats of the structure, mode of life and classification of fishes, may be said to have attained the status of a Science in the time of Aristotle. The Greeks were familiar with approximately 200 varieties of fish, but, in succeeding ages the systematic study seems to have been somewhat neglected, as indicated by Oliver Goldsmith's statement in his "History of Animated Nature," that "The numbers of fishes to which we have given names and of the figure at least of which we are familiar are above 400."

During the 160 years that have passed since these words were written, the study of fishes, incited by economic necessity and, in some measure, by the undeniable fascination of the subject, has so progressed that at least 15,000 species are now recognized. It is not to be thought, however, that this represents a complete list, for, although inland and coastal zones have been well investigated, in those vast reaches of the Ocean beyond the Continental Shelf, lie regions almost untouched by the scientist.

The work of Dr. William Beebe in his "Bathysphere" has revealed some of the grotesque and almost incredible structural changes that have been produced in "abyssal fishes" by the terrific pressure, darkness, extreme cold and other peculiar physical conditions of the ocean depths. Gargantuan heads attached to attenuated bodies, jaws armed with recurved teeth so large as to prevent complete closure; mouths capable of gaping wide enough to engulf objects twice the size of their possessors and weirdly flashing lights, complete with lens and reflector, are but a few of the features that combine to present a picture of creatures comparable only with the monsters of myth and legend.

The abyssal fishes represent extreme cases of adaptation to environment but all fishes show more or less interesting modifications, usually brought about by the exigencies of securing food and mates.

The common Angler-fish possesses a most efficient apparatus, used for obtaining food with a minimum effort. The anterior ray of the dorsal fin forms a fishing rod, permanently baited with a tag of skin. The fish lies half buried on the sea bottom, with cavernous mouth agape, gently waving the rod above it. When small fry, attracted by the movement, swim closer to investigate, a sudden snap is all that is necessary for the Angler to appease its hunger. In several deep-sea relatives the effectiveness of the appliance is increased by the addition of illuminated lures.

One member of the Angler family illustrates a relationship between male and female to be found nowhere else in the Vertebrate world. Soon after emergence from the egg, the male of this species seeks a female and grasps some portion of her body in his mouth. The lips and tongue fuse and become continuous with the skin of the female and so, the greatly dwarfed male remains for life as a minute parasite, attached to the body of a mate often a thousand times greater in size than himself.

True parasitism amongst fishes is comparatively rare. The Lamprey, found both in fresh and salt water, attaches itself to a larger fish by means of a powerful suctorial disc around the mouth and rasps off pieces of skin and flesh with its tongue. A close relative, the slimy Hag-fish, actually penetrates the body of its unfortunate host and feeds so gluttonously that in a short time there is left a mere bag of skin and bones in which the Hag rests until ready for its next meal. Apart from this unpleasant pair the only other representatives of the type are certain small tropical Cat-fishes normally parasitic in the gill chambers of other fish.

According to a widely believed evolutionary theory, the dry land was originally populated by invaders from the sea, who forsook the waters for the manifold advantages of a terrestrial existence. Strong links in the supporting chain of evidence are provided by the amphibious habits of certain fishes. A large number of fish, such as the Cat-fish and Common

Eel, can exist out of water for a limited time, provided the gill-filaments are kept moist. One of the Loaches, if necessary, can breathe by swallowing water, gaseous exchange taking place through the walls of the intestine, while the African and Australian Lung-fishes have progressed still further by the development of a lung-like air bladder, which enables them to survive during long periods of drought.

However, the height of development along such lines is attained by the Walking Gobies or Mud-Skippers, found in abundance along the banks of certain African and Australian rivers. Accessory breathing organs enable these quaint fish to spend the majority of their time out of water, walking about on the mud-flats and often climbing trees in search of food. The pectoral fins are modified to serve as legs and the eyes are exceptional in being elevated above the head and capable of swivelling in all directions. These fish have so far departed from the aquatic mode of respiration that, if confined underwater for any length of time, death

by drowning results. Truly a strange death for creatures usually considered as being entirely dependent upon water for respiration!

Coloration in fishes, which may be either protective or aggressive, is of a variety and brilliance unrivalled in the animal kingdom. Local fishes, typical of fresh water forms the world over, are comparatively dull company, attired in sober livery and only in the inhabitants of warm tropical waters are found those rainbow hues which help to make a coral reef a riot of colour. Verbal descriptions are hopelessly inadequate in conveying a true idea of the gorgeous lustre of these living gems. However, the following may indicate the extraordinary extent to which colour development may proceed:

In a tiny fish of the Barrier Reef, a Demoiselle, head and body are of an iridescent orange, diversified by three vertical bars of pale blue, while the fins are lemon yellow edged with black. Another, one of the Coffer-fishes, has the back and sides of its body grass-green shading to a pale lemon on the belly which is variegated by a reticulated pattern of blue. The sides are traversed by irregular bands of ultramarine outlined in chocolate brown. The tail is orange yellow, ornamented by loop-like patterns of ultramarine. Contrary to what might be expected, such contrasting colours do not act as an invitation to enemies but, amidst natural surroundings, are obliterative in effect.

Almost all fishes are capable of rapid colour changes to suit their environment. These adjustments are due to the presence, either below or above the skin, of a layer of pigment-containing cells, which, by the action of muscle fibres, can be expanded or contracted to disperse or concentrate the colour.

The local Perch normally possesses a bronzy-green back shading to yellow on the sides, the whole prominently striped with black. If placed in a white container for a short time, the stripes disappear and the whole body becomes very light in colour. When returned to more natural surroundings the normal pigmentation is resumed, often within a few seconds.

These mild efforts, are far surpassed by those of some marine forms, notably the Flat-fishes. These versatile creatures can almost perfectly imitate any type of natural bottom and even assume checker-board and polka-dot patterns when experimentally placed on such backgrounds.

The Ichthyologist, however, is not concerned solely with the accumulation of such bizarre and extraordinary facts as those presented in the foregoing paragraphs, but plays a role of considerable economic importance in relation to the fishing industry. There are many examples of the dangerous depletion of fisheries through the disturbance, by intensive commercial methods, of the complex systems of inter-relation existing amongst the forms of life which constitute the aquatic population. An understanding of these relations, to be gained only by scientific study, is essential to the intelligent administration and conservation of a valuable natural resource.

The waters of the earth offer a potentially inexhaustible source of food supply and, with a fuller knowledge of the fundamental laws which govern the fish population, it is possible that in future, the water will be "farmed" as the land is at present, the rich harvest being used for the benefit of mankind.

Two Rival Theories of Light.
I. The Wave Theory.

PROF. J. F. T. YOUNG

TWO rival theories of light arose in connection with the interpretation of certain phenomena associated with radiant energy or light. It will be well to recall the important role light plays in our universe. It is the agent by which we gain our best knowledge of the world around us and yet is itself unknown except by inference. Light is the intermediary between matter and the finest of our senses and yet is not itself material. It is intangible and yet able to press, to strike blows, and to recoil. It is impalpable, and yet the vehicle of the energies which flow to the earth from the sun. During the 19th century new types of rays were discovered in addition to those which produce vision, and gradually the conception developed that there is no region of space, enclosed or boundless, vacuous or occupied by matter which is not pervaded by rays, and that there is no substance which is not perpetually absorbing rays and giving others out, in a continual interchange of energy, which either is an equilibrium of equal and opposite changes, or is striving towards such an equilibrium. Radiation is one of the great general entities of the physical world. If we could still use the word "element," not in a restricted chemical sense, but in a deeper sense and somewhat as the ancients used it, we might describe radiation and matter, or possibly radiation and electricity, as co-equal elements.

Speaking very generally and rather vaguely too, light has been much more tractable to the theorists than most of the fields of research in physics and chemistry. Over a rather long period of years, it was, indeed, regarded as perfectly intelligible. The famous battle between the corpuscular theory adopted by Newton and the wave theory founded by Descartes and Huygens died out in the earlier years of the 19th century with the gradual extinction of the former. The history of optics in the 19th century, from Fresnel and Young to Michelson and Rayleigh, is the tale of a brilliant series of beautiful and striking demonstrations of the wave-theory; of experiments which were founded upon the wave-theory as their basis and which would have failed if the basis had not been sound; the tale of instruments which were designed and competent to make difficult and delicate measurements of all kinds—from the thickness of a molecule to the diameter of a star—and which would have been useless had the theory been in error. The details of the bending of light around the sides of a slit or the edge of a screen (diffraction), the intricate pattern of light and shade formed where subdivisions of a beam of light are reunited after separation (interference phenomena), the complexities of refraction through a curved surface, and the extremely complicated phenomena of the passage of light through crystals are predictable by the theory with all verifiable accuracy. The wave-theory of light like Newton's inverse-square law of gravitation, has undergone with triumph many extraordinarily precise tests. I know of no other that can rival either of them in this regard.

By the term "wave-theory of light" is meant the conception that light is a wave-motion, an undulation, a periodic form advancing through space without distorting its shape. Naturally, the question arises—"What is it of which light is a wave-motion?" Very many have proposed models for "the thing of which the vibrations are light", and many have believed with an unshakable faith in the reality of their models. It is not many years since men of science used to amaze the laity with the remarkable conception of the "luminiferous aether", a solid substance, millions of times more rigid than steel, and billions of times rarer than air, through which men and planets pass as if it were not there. Such an "aether", however, would be capable of transmitting a vibration with the enormously high velocity of light and as well satisfy the instinctive desire, especially since the time of Faraday, to interpret physical phenomena in terms of "action through a medium", a medium, moreover, which must be capable of transmitting energy.

The next stage in the development was the magnificent theory of light which Maxwell erected upon the base of Faraday's experiments, in which he imagined the production of the wave-train to follow from the reciprocal action of varying electric and magnetic fields. His theory immediately achieved the astounding success of presenting a value for the speed of these imaginated electromagnetic waves, determined exclusively from measurements upon the magnetic fields of electric currents, and agreeing precisely with the observed speed of light. Two supposedly distinct provinces of physics, each of which has been organized on its own particular experience and in its own particular manner, were suddenly united by a masterly stroke of synthesis "to which few if any parallels can be found in the history of thought" (Darrow).

As the evidence accumulated that light travels is a wave motion, and that its speed and other properties are those of electro-magnetic waves, it became imperative to inquire into the nature of the sources of light and the mode of its origin. It must be remembered that the wave-theory gave no answer to these questions. It is a theory dealing solely with the transmission or propagation of light after it has been created and left the source. But what is taking place at the luminous particle? What is the nature of the luminous particle? To this question all our experience and all our habits of thought suggest one sole obvious answer—that in the luminous particle there is a vibrating something, a vibrator, or more likely, an enormous number of vibrations, and the oscillations of these vibrations are the sources of the waves of light, as the oscillations of a violin string are the sources of sound waves. Inevitably it was assumed that when the path of light should at last be successfully retraced, the shining body would be found in the semblance of a vibrator.

For a few years at the end of the 19th century and the beginning of the twentieth it seemed that the desired vibrator had been found. Apparently it was the electron, the little corpuscle of negative electricity which had been found to be an all-pervading component of matter. H. A. Lorentz was the first to incorporate the electron into Maxwell's theory. He and others, Sir J. J. Thomson, the late Lord Rayleigh, were able to derive theoretical expressions for the effect of a magnetic field on a source of light—the Zeeman Effect; for the scattering of X-rays by matter giving an estimate of the number of electrons in each atom; for the scattering of light by molecules, solving acceptably the age-old problems of the blueness of the sky and the redness of the sunset. These and other numerical agreements between the "electron theory of matter" and experience were very striking.

Several basic postulates were common to all these theorctical treatments. The radiation was emitted by the electron in its vibration; Larmor's formula was invoked, with his emphatic statement that an electric charge undergoing acceleration must radiate per second a definitely calculable amount of energy; the frequency of vibration of the electron. The whole of the "classical" theory of Physics was either explicitly or implicitly included in these mathematical derivations. In particular I mean the idea of "equipartition of energy" due to Maxwell and Boltzmann and that of continuity which is so important in Mathematics.

Such was the state of affairs in the late '90's. The wave conception of light propagation had existed for more than two centuries, and it was seventy-five years since any noticeable opposition had been raised against it. The electromagnetic theory of light had existed for about 30 years, and now that the electron had been discovered to serve as a source for the waves, which in their propagation through space had already been so abundantly explained, there was no effective opposition to it. Not all the facts of emission and absorption of radiation had been accounted for, but there was no reason to believe that any one of them would not be amenable to treatment. Authoritative statements by eminent scientists, in fact, gave the idea that the epoch of great discoveries in Physics was ended. It was, in reality, just beginning.

It was in the attempt to derive a theoretical expression for the distribution of energy in the continuous spectrum of a hot body that radical difficulties were encountered. The properties of the radiant energy issuing from a "black-body" (in practice a hollow, uniformly heated enclosure) had been defined in many precise

investigations and led to the enunciation of various laws, all experimentally sound.

(a) Draper's law—that solids or liquids (but not gases) begin to emit visible thermal radiation at 500 - 550° C.

(b) Prevost's Theory of Exchanges, 1792, —that a continuous interchange of energy takes place between bodies in thermal equilibrium as a result of the reciprocal processes of radiation and absorption.

(c) Kirchoff's Law—1859—that the "quality" of the heat radiation produced in an enclosure surrounded by any emitting or absorbing bodies whatsoever, all at the same temperature, is entirely independent of the nature of such bodies.

(d) Stefan's Law—1879—that the total energy radiated per unit area per second by the body is proportional to the 4th power of its absolute temperature.

(e) Wien's Displacement Law — that as a body gets hotter the wave length of maximum energy decreases such that the product of the two is constant.

(f) The Theoretical Distribution of Energy among the wavelengths of the continuous spectrum had been worked out in the form $E_L = CL^{-5}f(L.T)$, where L is wave-length.

(g) The Experimental Distribution of Energy was known with great precision as a result of the work of Lummer and Pringsheim, Rubens and Kurlbaum, and Coblentz.

The distribution formula just quoted (f) is extremely significant for it represents the limit of success of "classical" theories in explaining the spectral distribution of energy in the continuous spectrum. It means that, given one experimentally observed distribution curve for one temperature, that for any other temperature can be successfully predicted. But the "classical" theories have failed to predict the relation between energy and wave-length in the original curve from which others may be computed. The case for "classical" physics, as based on thermodynamical grounds therefore rests with that experimentally correct but incomplete equation.

Various attempts, notably by Wien and the late Lord Rayleigh and Jeans, failed to discover this f(L.T). The form of the curve was known, but its equation could not be obtained. The Rayleigh-Jeans formula for the energy distribution curve ($f(L.T) = L.T$) represents the best that can be done towards a solution using the Newtonian mechanics and the Equipartition Principle, both of which had proved of such brilliant service in the development of the Kinetic Theory of Gases. The result was disappointing in the extreme. The Rayleigh-Jeans formula predicts that the total radiant energy from a hot body will be infinite, whereas direct experiment, and general experience as embodied in the Principle of the Conservation of Energy, show that the total radiant energy is finite. Nor did the formula show the characteristics of the actual energy distribution curve except that it did agree with the experimental facts for the particular region of the long wave-lengths, that is for large values of (L.T).

Wien's formula in which f(L.T) was developed theoretically from very special assumptions to be an exponential $e^{-B/LT}$ was much more successful though it too incorporated the whole of "classical" physics. It gave a curve of the right type and of fair agreement with the experimental facts as then known. Not until precision measurements were completed in 1900 was it discovered that, while Wien's formula fitted the experimental curve perfectly in the region of short wave-lengths, it predicted too low a value in the longer wave-lengths. The final true formula must yield the Rayleigh-Jeans formula for the legitimate substitution of the mathematical condition (L.T.) large, and Wien's formula for the special condition of (L.T) small. What was this formula which had evaded the grasp of some of the most eminent mathematical physicists of the age?

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(Editor's Note—This is the first of two articles on the Rival Theories of Light. The second and concluding article, in which Prof. Young will discuss the origin and development of the Quantum Theory, will appear in the January issue.)

Pioneering in the Science Building.

HENRY P. SEDZIAK

MANY members of this season's crop of third year Science Students in wandering through the Science Building for the first time, must have been mystified by the words "Curator's Stores." Who is or was the Curator? Is it another name for caretaker? They take for granted the City water, the steady stream of fuel gas from the power-house. "It must have been always thus," they reason. "Not by a long shot," answer those who know. Some of the early experiences of one who attented third year at the time the Science building was opened may be of interest to present-day test-tube shakers.

Although the calendar had announced that classes would start in the Science building, we were mildly surprised on arriving for the first time to find that the edifice was still in the process of being built. After meeting friends and agreeing that we were real pioneers, we started on a hopeless search for our professors, some of whom we did not know by sight. Easiest of all to find was Prof. Frank Allen who had taught us Physics II the previous year, and who was going to teach us Physics III. We, who were 100% Science, had to bear the insult of taking lockers and starting lectures in the Arts building. I remember Prof. Allen remarking about the doors of the class rooms in the Arts building. He said that money was spent on doors to keep sounds out, and then holes were put in doors to let sounds in. After a while we were able to start classes in the Science building, but we had to content ourselves with sitting on plaster-covered seats.

Dr. H. P. Armes gave the lectures in third year Organic Chemistry, Prof. H. F. Roberts lectured in Botany III, and Prof. Curtis-Riley gave Zoology III. At that time, many of the Physics III practical experiments were on electricity. However, the arrival of the D.C. Dynamo at the end of the following February delayed our starting practical physics till that date. Since most of us had full time-tables, we could not do more than the usual three hours per week. So, we were given a lucky break, or perhaps we were gypped, according to the way you looked at it. We all agreed, though, that we should have been given a refund. In that same year, due to speedy lecturing, Prof. Curtis-Riley finished his course of lectures for the year in mid-February.

North of the Science building, where Mr. Gilmour now lives, a large neon sign proclaimed "Washburn's Restaurant." My reminiscences of it take poetic form,

"—Where the music played,
As your bill you paid."

At least, one could obtain a decent meal on the campus in those days. South of the Men's residence was the Tucke Shoppe where one could partake of light lunches and get cigarettes. For several years after a disastrous early-morning fire burnt the Tuck Shoppe to the ground, cigarettes were unpurchasable on the campus.

Mr. Andrews was the Curator (superintendent) of the Arts and Science buildings, with headquarters in the Arts building. Among other duties, he locked after lockers and notice boards. His permission had to be obtained before any posters or notices could be put up, and these he put up himself. Any unauthorized ones he removed. Mr. Andrews left the University in the general shake-up of 1933. Speaking of lockers: in those palmy days the $1.00 locker fee was refundable at the end of the session, and high quality padlocks were supplied without charge.

At that time, if you missed your street car you waited one hour for the next one, and moreover, you paid one zone fare as well as the city fare. Coming to the College, city fare was paid as usual on boarding the car, and the zone fare was paid as you left it at the college. Many were the times that students left by the back door before the motorman remembered to turn off the tread'e step. There were no reports of Scottish students starving to death on the street-cars. There was a half-hourly street car service to the college junction which was sometimes used by students who had missed the

regular car and, failing to get a lift, did not wish to lose a whole hour. Later, special Winnipeg Electric buses were run to the college morning and evening, on which the $6.00 monthly pass was good. These buses were so crowded that you had to get out of the bus before you could turn around. During one winter, neither Fort Garry municipality nor the Provincial Government cleared the highway properly of snow, resulting in a trough shaped highway with plenty of thrills for motorists and bus passengers alike, especially since some bus-drivers would not slow down to less than thirty miles per hour when passing other traffic. The daily papers got on the scent of this public danger, and the ice was chipped off the highway, the laborers finishing one day before the general thaw. During our first year at the Fort Garry site we had a terrific snowstorm that tied up street car traffic completely. The four o'clock car got home about ten p.m.

vented oxidation of the water and as a consequence, it came from the tap with a peculiar barnyard smell. I remember doing a physics experiment which required working over a shallow tray of water. I was feeling rather low before it was finished. Agriculture and Home Ec. students tolerated all this for years without a murmur, but such a hubbub was raised by the newly-arrived Arts and Science students, that finally, tanks of drinking water from the city were placed in the basement of the Arts and Science buildings. In the Arts building, paper cups were provided, but in the Science building, due no doubt to the cleanly habits of Science studes, a common glass was good enough. I remember hearing of a discussion of the water by a group of professors. Prof. J. F. T. Young is reported to have said, "This water—you can't drink it. It is no good for photography —I wonder if it would put out a fire?" After a long period of suffering, students heard with joy

The gas to the Science building was supplied in those days by several small tanks of Winnipeg Electric gas lying on the ground just west of the building, where the new parking space now is located. Several of these tanks would be used in an afternoon. Something must have been wrong with the reducing valves on these tanks because when a tank was first attached, the gas flames in the building would shoot up to a considerable height. The flames would gradually become smaller and smaller, and after a while, would die out altogther. Embryo chemists would then hang out of the chemistry lab windows watching to see when the next tank would be attached. The incessant change in the flames necessitated constant care, and often preparations would be spoiled. There was no leaving an experiment in progress by itself in a laboratory while one went for a smoke or a hand of bridge.

First place in my mind is held by the memory of the water supply, a very strong memory, but not as strong as the water. At that time, and previously, the water was taken from the river, chemically treated, and sent through the pipes. In summer it was passable but as soon as the river froze over, it was impossible. The ice prevented oxidation…

that city water would be brought in.

Another landmark, now missing, was the famous Dairy Lunchroom. This was located in the basement of the Dairy building where the Dairy store is now located. It was famous for large dishes of ice-cream and triple scoop milk-shakes. Soup, sandwiches, coffee, and a variety of other things were also served. There was no cafeteria like we have at present, so at lunch-time, the line formed near the door of the building. It was reported that even students who were boarding at the residence were coming there for meals. Two Home Ec. Grads known to everyone as Daisy and Marion, were in charge.

One final point comes to my mind. Shortly after the Science building was opened, some unknown organic student left his preparation on a window sill where it proceeded to tip and spill. A large brown stain on the stone wall outside was the result. Authorities raised a rumpus, and with much ceremony the mark was effaced Strict regulations followed. For the last year or two a similar but larger stain adorned the west side of the Science building. Since the building was no longer new, the spot did not even merit attention, and for all I know, it may be there yet.

Psychoanalysis, Our Debt to Freud.

JOHN M. O'KEEFE

"The old order changeth, yielding place to new."
Tennyson.

A NUMBER of the more common forms of mental disorders are not caused by organic (structural) derangements and cannot be identified with any specific physical symptoms. Due to this fact doctors, for centuries past, more particularly. during the last hundred years, have sought an effective therapeutic method by which they could treat and cure the mentally disordered.

In the year 1900, such a method was put forward in broad outline in a work ("The Interpretation of Dreams") written by Dr. Sigmund Freud, a physician and scientist of Vienna with whom there was associated a certain group of co-workers. This, since, famous book brought upon the author shouts of derisive laughter from medical men and snorts of disgust from the clergy of the day. With the passage of years these same groups of public workers have tended to give a kindlier hearing to the Freudian technique which the author termed "psychoanalysis" and today, the name of the creator of the science of unconscious mental processes is linked along with that of Darwin and the Curies as outstanding in the scientific progress of the past century.

The term psychoanalysis has, in a sense been copyrighted by Freud. The method, according to the author, divides the human psyche into three components—the super ego or ideal of self, the ego or perceptual self and the id. The degree of integration of these components in striking a wholesome functional and dynamic balance in view of the demands of ordinary living, requiring compromises, renunciations of anti-social impulses or their sublimation, determines one's mental health or his ability to adjust satisfactorily to life.

Why should anyone resort to such a theory as this? Its sponsors maintain that many of the phenomena of human behavior such as dreams, hysteria, irrational fears, and various emotional maladjustments cannot be explained in terms of what we know about mental processes and the functioning of the nervous system. As might be expected, such a theory has been turned into bizarre and fantastic forms by charlatans and has given uncritical writers an opportunity to exploit the persistent interest of the public in the mysterious and occult.

Freud and his group should not be held responsible for the distortions and perversions of his theory. The criticisms which have been levelled at the theory may be fairly regarded as pointing to its inadequacies and limitations rather than to basic defects. Human personality is a complex organization of variables and no theory can be fairly condemned if it fails to explain all points and all cases. In spite of its limitations or even defects, the theory as elaborated by Freud must be regarded as a brilliant contribution to the study of human nature. It has led our interests and attention to regions of the mind previously unknown and charted. We need not commit ourselves to any school of psychology in order to believe in the continued effectiveness of past experience, and that is essentially the main thesis of the psychoanalytic view of mind.

Freud's theory and practice grew out of the necessities of the consultation room of the physician. The latter in the practice of his profession has at all times but two alternatives, firstly, the prevention of disease and secondly. the cure of disease if the malady has already attacked the patient. Since the first is not always possible either in physical or mental disorders, the physician must resort to the second. To effect a cure, a technique must be employed and the degree of the physician's success depends upon the effectiveness of the technique used. Freud appreciated these facts and put forward psychoanalysis as the most effective technique of which he knew in the cure of mental disorder. Today, one of the strongest pillars in support of the psychoanalytic procedure (which is even admitted by its most severe critics) is that as a therapeutic method it works. Lacking any other as effective

technique, it is possible that for this reason psychoanalysis has been so favorably accepted by the medical profession.

Apart from psychoanalysis, ordinary psychological theories and methods are inadequate in interpreting the condition of patients suffering from neuroses and various forms of emotional maladjustments. A behaviorist as such would be helpless if asked to diagnose and suggest treatment for such cases. What the patient says and does is seldom any explanation of his difficulty. He is more or less unconscious of the real cause of his symptoms The physician must pursue some method of bringing to light hidden motives, their significance and their settings, before the patient can be rationally treated, and this cannot be done by studying merely his reflexes or observing his actions. In brief, the physician is dealing with the genetic-dynamic, implicit elements of personality which are the forerunners of the patient's behavior.

Freud, at once the scientist and physician, found through his researches that the dream furnished the royal road to a knowledge of the unconscious and thus the psychology of dreams stands out in the centre of the psychoanalytic theory and of the mechanism of unconscious mental states. In fact, Freud's investigations of dreams furnish the chief technical procedures for psychoanalysis. Dream interpretation. however is difficult, requiring the utmost caution since it is a combined art and science.

Freud was led to the scientific study of dreams because in the earlier stages of his analytic treatment of the psycho-neuroses or as it was then termed, the cathartic method, he found that his patients frequently related strange, distorted and bizarre dreams. Further investigation demonstrated that these dreams had the same roots in the unconscious mental life of the patient as the psycho-neurotic symptoms themselves and consequently the technique for the analysis and meaning of dreams was elaborated. In other words, the same unconscious mechanism was responsible for the creation of both dreams and symptoms and thus the dreams furnished the best means for the analysis and treatment of the symptoms.

To summarize briefly in Freudian terms:—A dream is the fulfilment of unconscious repressed wishes and uses as material either childhood episodes, adult happenings, various physical stimuli, pre-sleeping thoughts or, more generally, any experience carrying a strong emotional tone, all of which are woven into the phantasmagoria of the dream. The latent thoughts alone explain the dreams and this explanation can only be investigated through the special technique of psychoanalysis.

During the past thirty-five years, the followers of psychoanalysis and the number of psychiatrists specializing in this method of psychotherapy have been increasing. To be sure, the concepts and techniques first formulated by Freud have taken on new color and modifications in keeping with the results of treatment and research which go hand in hand with every case. More recent developments reveal the fact that psychoanalysis is not primarily concerned with symptom analysis but chiefly focuses upon personality analysis and re-education. It utilizes free associations of the patient, dream-experiences and the rapport which develops between patient and physician during the course of psychoanalysis. However, serious problems in resistance may arise between the physician and patient during the transference since at one time the latter transfers affection and at another time antagonistic feelings. The skill of the analyst in handling these alternating phases largely determines the success of the analysis. The patient during his analysis, which may take several months or years for its completion, gradually becomes more and more conscious of his personality functions and the reasons thereof, particularly with respect to the unconscious part of his makeup. Unrecognized conflicts arising from clashes between the id, ego and super-ego bring about symptoms and maladjustment to life. Such abnormal conflicts are said to be due to repression of wishes, desires and impulses which are or were more or less at odds with conventional morality or social custom. When these conflicts and the causes thereof are, through free association and dream-analysis, brought to conscious recognition of the patient and accepted as an integral

part of his personality, side-tracked life energy or libido is made available for adult or mature personality growth and functioning. With the coincident liberation of repressed energy which now becomes available for use in rebuilding personality and character into more mature patterns of behavior and in formulating a more adequate philosophy of life, the patient is left to choose voluntarily the specific paths of mentation and concrete behavior which he sees fit to espouse.

Although psychoanalysis is a costly and time consuming method of personality reconstruction yet, in well-trained hands, it holds a legitimate place in psychotherapy but by no means an exclusive one.

No. matter what method he uses or what theory he accepts, every clinical worker in this field today must pay tribute to Freud. He formulated a point of view which challenged all others and compelled reconsideration and restatement of a very large portion of human psychology. His views have filtered into and affected such widely divergent fields as biography, sociology, literature, drama, political and economic theory. They have led to a study of motives and ideals back of social practices and have revealed that they are often different from what they appear to be on the surface.

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Women in Science.

MAURINE SULLIVAN

SINCE the days of Adam the question of woman's equality with man has never failed to evoke a storm of contradiction. Countless arguments have been advanced, but none has decisively settled the matter. However, there are several phases of it which do not despair of solution. One of these may well be—Have women a place in science?—or put in another way—Has women's contribution to science been, or is it likely to be, such that it warrants them greater encouragement in the field of research?

The question is best answered by a consideration of the work of three women, who in the past fifty years, have opened new fields of scientific knowledge. A limited time is reviewed because it is only in the past half century that women have had equal opportunities with men in the pursuit of higher education.

The first of these women is Agnes Pockels. Fifty years ago, in a small town in Northern Germany, a young girl of nineteen, with a strong bent for research, had observed the streaming of currents when salts were put into solution, and, by attaching a float to a balance, had found that salts increase the pull of the surface of the fluid. In other words, Agnes Pockels had discovered the phenomenon of surface tension! Through the efforts of her brother, a student at the University of Göttingen, her work was brought to the attention of a professor of physics. He failed to realize the importance of the discovery. For ten years she continued to study and experiment. Then an English physicist, Lord Rayleigh, began to publish articles on the same work. Agnes Pockels wrote to him describing her investigations. Through him her work was published in the English journal, "Nature." There followed upon this first success a publication of her complete works in English. In 1898 Germany was proud to accept her works for publication. Without the aid of university research laboratories, and with home-made appliances, this women observed a phenomenon which opened up a new branch of physical chemistry. Certainly her contribution to science cannot be disregarded.

The second woman under consideration is one of the world's greatest mathematicians. She is Emmy Noether, likewise a German. She was one of a brilliant group of mathematicians at the University of Göttingen. Later she came to America, and, just previous to her death, was on the faculty of Bryn Mawr college. Her field was algebra. Professor Einstein said of her, that she has discovered methods which have proved of enormous importance in the development of present day younger generation of mathematicians. Her strength lay in her ability to operate abstractly with concepts. Nature endowed her with a creative insight which is only to be described by the word "genius," and that term is applied unequivocally and on the same terms as man.

The third, and best known of these women, is Marie Sklodowska Curie. Today she is regarded as one of the world's outstanding scientists. Forty years ago she had a position setting up apparatus and washing bottles in the physical science department at the Sorbonne. Gradually her interest in science brought her to the attention of the professors. She was permitted to enter the field of research. In 1895 she married Pierre Curie, a scholar engaged in similar work. Three years later she obtained her degree. Then she began upon her immortal piece of work which led to the development of radioactivity. It was previously known, through the investigations of Becquerel, that certain elements, such as uranium, emitted rays which resembled X-rays in their effect upon the photographic plate, and which ionized the air about them. Armed with an electroscope, Madame Curie made a systematic investigation of various elements and their compounds, with a view to finding whether or not they possessed this ray-emitting power. Only one other element apart from uranium, namely thorium, possessed it. The next discovery was a momentous one. A sample of pitchblende, from which all the uranium had been extracted, was found to possess five times the ray emitting power of pure uranium. After a long and tedious analysis of a ton of pitchblende, Madame Curie succeeded in isolating a salt of a new element, which was two and one-half million

times as active as uranium, and to which she gave the name "radium." In 1910 she isolated the pure element. The development of radioactivity, and the subsequent opening of an entirely new branch of physical science is well known to every student of science. It has been said that radioactivity is to the science which has gone before, what the aeroplane is to the tortoise. This stupendous discovery belongs to Madame Curie. The way was paved for her by many; her husband was a good helpmate, but in spite of similar work done in other countries, she triumphed where all others failed. To her belongs the reward.

If, in the past fifty years of skeptical tolerance, such important advances in science have been due to women, surely their work justifies the advent of women into the field of scientific research. It is not being unduly optimistic to suggest that, if the past could be so fruitful, then the future is likely to be more so. Time will tell. Meanwhile there remains the stolid barrier of man's superiority complex.

Nature's Laboratories, Inc.

RICHARD V. HEINZELMANN

IF this title can be given to any one spot on our earth, it certainly is most appropriate when applied to Yellowstone National Park, for, when one enters this region one is within the world's most amazing museum of volcanic phenomena. The geysers which here abound in greater numbers and magnificence than elsewhere in all the world, the sculptured Yellowstone Canyon, painted in all shades of the spectrum save blue, the great falls themselves, leaping from ledges of igneous rock, speak eloquently of the tempestuous ages when all this region was torn with violent eruptions of volcanoes. Even the mountain profiles and the soft rolling surfaces are the result of the shaping of lava by many waters But the interest to scientists is not merely geological, for Yellowstone abounds in wildflower gardens, and over eighty percent of its area is heavily timbered with many types of trees. Furthermore, it is America's greatest wild animal sanctuary. And so, the visitor can hardly help but be impressed by a sense of nearness to nature's secret laboratories.

To understand these strange phenomena, we must know something of the geological history of the region.

Originally, this whole territory was a flat prairie, such as that on which we live. It is well known that the central region of America was visited many times by shallow seas, which came and went at great intervals. These brought mud, sand and lime into the region which now constitutes the park. These three substances served as raw materials out of which the present rocks were built. Thus, sand soon became compressed into sandstone, the mud into shale, and the lime into limestone.

The second period was that of volcanic eruption. Practically the entire region is volcanic. Not only the surrounding mountains, but the great interior plains are made of material once ejected, as ash and lava, from depths far below the surface. Positive evidence of Yellowstone's volcanic origin is apparent to all in the black glass of Obsidian Cliff, the contorted breccias (rocks made up of angular fragments) along the road near the top of Mount Washburn, and the brilliantly colored decomposed lava walls of the Grand Canyon. All these great volcanoes are now extinct. There appear to have been three main lava flows, but about ninety percent of the present formations belongs to the second flow, which formed the region around the canyon. This action was coincident with the

powerful dynamic movements which uplifted the surrounding ranges and blocked out the Rocky Mountains. The lava, which at some points reached a depth of two thousand feet, cooled quickly at the surface to form rhyolyte (microscopic crystals, whose only essential difference from those of granite is their size.) The volcanic rocks present may be divided into three main groups, andesites, (rocks consisting chiefly of feldspar, with mica, hornblende, etc.) rhyolites and basalts. After the dying out of the andesitic and basaltic lavas, followed by a period of erosion, immense volumes of rhyolite were erupted, and this did more than anything else to bring about the present physical features of the park tableland. Even such deep gorges as the Yellowstone have nowhere worn through these rhyolitic flows. Although the rocks of the plateau for the most part belong to one group of acidic lavas, they offer as grand a field for the study of structural forms, development of crystallization, and mode of formation of acidic lavas as can be seen anywhere in the world. Obsidian, pumice, pitchstone, ash, breccia, and an endless development of transitional forms, alternate with the more compact lithoidal lavas (stony or non-vitreous) which make up the great mass of the rhyolite. Since the outpouring of this great mass of rhyolite and the building up of the plateau, the region has undergone faulting and displacement; immense blocks of lava have been lifted bodily, and the surface features of the country have been modified.

The most recent phenomenon was the ice age which occurred relatively recently, about 25,000 years ago. Though occurring at the same time as the eastern glacial period, this action was in no way connected with the latter. In receding it left irregular deposits which resulted in the many lakes and swamps to be seen in the park to-day.

Since the dying out of the rhyolite eruptions, erosion has greatly modified the entire surface features of the park. Some idea of the extent of this action may be realized, when it is remembered that the deep canyons such as the Yellowstone have all been carved out since that time. To-day, these gorges measure several miles in length and from one thousand to fifteen hundred feet in depth.

There are two main theories as to the origin of the Grand Canyon of the Yellowstone. The fact that sand and rock terraces are found at a height of one hundred and sixty feet above the present level of Yellowstone Lake which is drained by the Yellowstone river running through the canyon, leads us to believe that at one time the lake was much larger, and extended to within a few miles of where the canyon now is. At that time it did not drain through the Yellowstone River, but to the south through the Snake River, into the Columbia, and thence into the Pacific. Then a small stream to the north, now the Yellowstone River, began its "headward erosion," that is, dug itself in as it were, and backed up its source till it reached the lake, bringing the latter to its present level and at the same time forming the canyon. Another theory, put forward last year in a **Ph. D.** thesis of a New York scientist, claims that the canyon existed before the change in level of the lake, and, during the glacial period, became filled with ice, blocking up the channel and causing the lake to rise and flow to the south. Then, when the glacier melted, the old course was again resumed. The two great falls of the canyon are a result of irregularities in the erosion of the rhyolite by the hot gases from below.

The cause of the high temperatures of the waters in the park, must be found in the heated rocks underground. It does not follow that the water comes from some deep-seated source, but it is believed that the waters brought up by geysers and hot springs are mainly surface waters, which have percolated down a sufficient distance to become heated by large volumes of steam ascending through fissures and vents from much greater depths. The long-continued action of the hot water and vapors has transformed the rhyolite into many forms, even to clay, which rain, etc. can wash down the slopes, causing great streaks of color. The coloration of the canyon is mainly due to the presence of iron oxide in different stages of hydration.

The rock ledges where the falls occur are much less decomposed than the rest of the gorge, and so more resistant to the erosive power of the water, which is extremely slow here due to the water's purity. Water must contain mud or sand before it can become an effective grinding agent. The hard walls of rock at Upper and Lower falls are three hundred and one hundred feet thick respectively, and we may well expect that at some future

date, many thousands of years hence, tourists may find only one fall in the canyon instead of the two now present.

The color of the rest of the park is not due to mineral deposits, but to minute algae which grow in the hot water of the hot springs and geysers. When, for any reason, the water ceases to flow, the color at once disappears. Contrary to popular belief, the water of the hot springs is not boiling as it apears to be, but is continually stirred up by hot vapors, mainly CO_2 and H_2S, passing through it from below.

The terraces of these hot springs are built up quite rapidly, into soft deposits of travertine (98% $CaCO_3$), brought up from below, and left as the water cooled or evaporated. The geyser craters are built up of a very hard material called geyserite. The reason for the difference in these structures is this: In most of the hot springs, the steam, although ascending through fissures of igneous rock, comes in contact with waters found in the limestone strata, which here form the surface rocks. These limestones have furnished the lime held in solution and precipitated as travertine. On the other hand the mineral constituents of the plateau waters are derived almost exclusively from highly acidic lavas, which carry very little lime, but more silicious matter. The deposition of this silicious matter, or sinter, on the geyser crater is due to evaporation of the water, not to its cooling. The algae in the hot water greatly affect the deposition of both sinter and travertine. The geyserite is deposited very slowly, about one-thirtieth of an inch a year, as shown by the fact that initials painted on the surface eight years ago are still plainly visible.

Geysers occur only at places where the high temperatures of the depths of the earth approach close to the surface. Water from the surface, trickling down through cracks in the rocks, becomes itself intensely heated, and forms steam which expands and forces upward the cooler water that lies above it. The geyser tube must be crooked or constricted sufficiently to prevent easy circulation of water. With continued heat applied from below, the water in the geyser tube becomes superheated (as shown by the temperature of the water issuing at one place being 140° C., as compared with a boiling point of 91°C.), and expands so that the less heated column above can no longer weigh it down. Then water bubbles over and relieves the presure on the superheated water below, which turns into steam, pushing the entire mass upward in an eruption. The complete process is then repeated. (Many a first year chemistry student has seen this principle in action when trying to heat a liquid in a test tube.) Only the hard silica wall will stand the explosive violence of the eruption. A less resistive material like travertine will not produce geysers.

During the volcanic period, the dust and other materials thrown out, periodically covered the forests, and between these volcanic periods, new forests grew above the last. At one point in the park we find no less than thirteen forests, one upon the other, exposed in a cross-section formed from water erosion. The petrified trees are formed by silicious matter in the water filtering through the ash, and being deposited in, and replacing, the pores or cells. Several years ago many petrified trees were standing erect, but in recent years "human erosion" has greatly reduced that number. Many of the species found, such as the giant oak and redwood, indicate that a much warmer climate once existed there. Perhaps in a few hundred thousand years this region may again experience a volcanic or glacial age, or be submerged under a shallow inland sea.

Almost as interesting as the geological formations is the abundant and variegated plant and animal life existing in the park.

Due to the extreme altitude of the main plateau (between 7,000 and 8,500 feet above sea level.) and the still loftier peaks and ridges which rise from 2,000 to 4,000 feet above this, the predominant forest growth is the evergreen Going from the plateau upwards we have the following trees;—the cottonwood, growing along streams, with narrow, pointed leaves and blue berry-like fruit; the limber, or "white" pine. with leaves grouped in bundles of five; the aspen, the only common broadleaf tree; the Douglas fir, the greatest source of lumber in the west; the lodgepole or jack pine, the most common tree in the park, and distinguished by its leaves in groups of two; and about the timberline, spruce, alpine fir, and white-bark pine. There is hardly a region in North America in which we find a more abundant and varied display of wildflowers. The altitude and short season seem to be compensated for by ultra-bright colors, especially blues, yellows and reds. Among the many varieties we find the lupines.

low larkspur, columbine, fire-plant, many of the snapdragon family in various disguises, and a plant called pedicularis, from which the Indians used to make a solution to cure that disease known as pediculosis.

The park is also noted as one of the world's greatest game sanctuaries. Without leaving the car, one can see roaming around some of the several thousand elk, deer, antelope, mountain sheep, moose, beaver, and in some parts, buffalo, of which there are about a thousand.

But, of course, the animal which arouses the most interest is the bear. It is a common event in the park to see a bear stopping a car and begging for food. In some cases the bear will put his head in the window and make an attempt to shake hands. The most common kind is the Black Bear, who is very fond of sweets of any sort, and who climbs trees almost as soon as he can waddle. The Grizzly Bear is truly the king of the forest. Sometimes reaching a weight of 1,100 pounds, he can crush all the ribs of an elk at one blow. He doesn't climb trees, and is usually seen only early in the morning or late in the evening. These bears are, however, not killers, unless very hungry. When in that state, they have been known to tear open canned goods such as canned meat and devour the contents. Occasionally, they invade another type of "canned goods," for sometimes a proud owner of 1916 model Ford will come back to find the top ripped off and his package of bacon missing. The female bear also becomes dangerous when anyone tries to become friendly with her dear little cubs These little fellows, born about February while the bear is in hibernation, weigh at birth less than a pound. The park carries on a series of lectures by ranger-naturalists, and one of these dwelt on the habits of this noble animal. Unfortunately we found that even this region was not entirely free from the strikers and picketers which are so common in the world to-day. The picketers were the lowly mosquitoes, and the strikers were the audience itself! Indeed, the pests were so effective that the speaker had to skip over the "bear" facts, and let his listeners out early.

In addition to this popular outdoor amphitheatre lecture system, there are interesting museums scattered throughout the park, which soon enable the inquisitive traveller to become an intelligent observer of the many things to be seen in this scientist's paradise, Nature's Laboratories, Inc.

In Memoriam

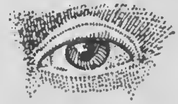
HARRY MORRIS SIRULNIKOFF

Science Graduate 1936

Accidentally Drowned

June 17th, 1936

VITREOUS HUMOR



By FOCAL

"Has your brother come home from college yet?"

"I guess so, or else the car's been stolen."

* * *

"Bill is a chap you don't meet every day."

"I don't meet him at all. He owes me five dollars."

* * *

Close Call

The parlor sofa held the twain
Fair damsel and her lovely swain,
  Heandshe.
But, hark! A step upon the stair!
And mother finds them sitting there—
  He————and————she.

* * *

He:—"You should see the altar in our church."

She:—"Lead me to it."

* * *

A man's first attempt to hold a girl on his knee might be called a trial balance.

* * *

Absent Minded Prof. Again

Wife:—"Has the prof. had his coffee?"

Maid:—"I don't know, ma'am."

Wife:—"Ask the prof."

Maid:—"I have, but he doesn't know either."

* * *

Lauder (applying for room at Manitoba Union):—"Can I get a room near the telephone?"

Clerk:—"Have you got a reservation?"

Lauder:— "What do you think I am, an Indian?"

* * *

Economic Cycle

The Italian Ditch-digger's refrain goes like this:

"I digga da ditch, to getta da mon,
To buya da bread, to getta da strength,
To digga da ditch."

* * *

Stude.:—"Have you made up your mind to go to the dogs?"

Stewed:—"Dogs? Dogs? No, I didn't get a bid."

Love

Love came like morning to a flower
And tender thoughts awoke;
Love lingered for a golden hour.
Then went and left me broke.

* * *

Customer:—"I want a quarter's worth of Carbolic acid."

Proprietor:—"Vell, dis is a pawn shop; but mister, ve got razors, ropes, and revolvers."

* * *

Veiled Remark

"Is this a picture of your fiancèe?"

"Yes."

"She must be very wealthy."

* * *

"How's your baby getting on?"

"He'll make a fine student!"

"How ever can you tell that?"

"He sleeps all day and makes the deuce of a rumpus at night."

* * *

A Blow

She:—"It's very good of you to ask me to dance."

He:—"Don't mention it, it's a charity ball."

* * *

Just Seasick

It was on a steamer. A goodly crowd had gathered in the smoking-room to discuss the old days in college. There were several Manitoba grads present, who had not known each other previously. Finally one of these offered to tell the faculty of any of his Manitoba companions. He singled out a tall, rangy chap with an intelligent face and said, "You're a Science Man, aren't you?" The questioned one nodded in the affirmative. The next chap was heavy-set with an aggressive jaw. He proved to be an Engineer. Turning to a sickly, dejected, slouching fellow, he asked, "You're an Artsman, aren't you?"

"Arts, hell! I'm just seasick," was the reply.

* * *

Customer:—"I want a hat."

Clerk:—"Fedora?"

Customer:—"No, for my wife."

SCIENCE ALUMNI ASSOCIATION

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ALUMNI NOTES

The intention is to present in the three issues of The Question Mark a complete News Bulletin of all the Science graduates.

1916

THOMSON, E. A.—Acting Chief Chemist, Mines Branch, Department of Mines, Ottawa.

1917

CLARK, U. D.—Residing in Toronto.

NORRINGTON, Anne—Spends the winters in Victoria, and summer on her ranch near Nelson, B.C.

1918

ANDERSON, O. T.—Professor of Mathematics Wesley College.

SHINBANE, Hyman—Is practising medicine in Los Angeles.

1919

BULMAN, Eileen (Mrs. A. C. Abbott) — 127 Grenfell Blvd.

GOWANLOCK, Nelson—Chief Biologist, Bureau of Scientific Research, Dept. of Conservation, Louisiana.

SHEWELL, Grace — Has retired from the teaching staff in Winnipeg, and left last month to make her home in England.

SWEET, A. H.—No news.

1920

RUNIONS, W. G. D.—Druggist at 541½ Ellice Avenue.

1921

HENNELL, Leo—Practising Medicine.

JOHNSON, W. P.—St. Johns Technical High School, Winnipeg.

LIPSETT, Sol. G.—Consulting Chemist with the J. T. Donald Co., Montreal — and word came this summer that he is now the proud father of a son.

LOWE, Chas. W.—Asst. Professor of Botany, University of Manitoba.

McHAFFIE, Ivan R. — Canadian Industries Ltd. Montreal.

MOORE, Andrew—Has left the city to do post graduate work.

WEINBERG, Mollie (Mrs. G. Soudack)— 409 Charles St.

1922

GIBSON, Catherine—Biochemist, Pathology Laboratory, Winnipeg General Hospital.

MAR, Peter G.—Last heard from in most interesting news letter received by his friends at Christmas — telling of his own and Andrew's marriage. He is in the Lester Institute at Shanghai.

MERRITT, Clifford A.—Teaching Geology at the University of Oklahoma, Norman, Oklahoma.

TURNBULL, Margaret (Mrs. C. S. Gow)— 781 Jessie Ave.

MOUNCE, Irene—Is in the Plant Pathology Lab. at Ottawa—Paid a short visit in Winnipeg this spring.

1923

ANDERSON, W. A.—Asst. Professor of Physics, University of Manitoba.

BROWNELL, Geo. M.—Asst. Professor of Geology, University of Manitoba. Married, two children.

CHATAWAY, Helen D. — At the Research Council Laboratories, Ottawa—Intends visiting in Winnipeg this fall.

CLARE, Norval S.—Chemist with an industrial plant, Niagara, N.Y.

EISENSTEIN, Sam (Dr. Easton)—Is practising medicine in the city and finds time to play a fair game of golf.

HANNESON, Hannes—Unknown.

HERRON, Lee — Teaching in Centennial School, West Kildonan.

HUGHES, Frank R.—Canadian National Railways.

MACKAY, Dorothy (Mrs. C. I. Allen) — 715 Virginia Park, Detroit, Mich.—with her husband and two small sons visited in Winnipeg and at the Lake of the Woods this summer.

MORGAN, Catherine—(Mrs. V. M. Whitmore) —Head of the Training Dept. in Powers, Ltd., Minneapolis. Resides at 3906 Colgate Ave.

NUSER, Arlee—No news.

OSTRY, Harry — Believed to be practising medicine in New York.

SCOTT, Kirk (Mrs. T. G. Wright)—814 Dorchester Ave.

SIGVALDDASON, J. M. — When last heard from was practising medicine at Shoal Lake.

TELFER, Luella M.—573 Gertrude Ave.

YARWOOD, Walter S.—Has recently undergone an operation and has been forced to relinquish his teaching duties in St. Vital for the present.

1924

BAKER, W. Frank—Geologist, God's Lake Gold Mines, Ltd., God's Lake, Man. Married. Recently became the proud father of a daughter.

BICKLE, Warner P., B.A.,—Director and General Superintendent, Acadia Construction Co., Ltd., 101 Upper Water St., Halifax. Married.

BIRD, Ralph D., M.Sc. (Man. '26), Ph.D. Ill. '29)—1260 Eighth St., Brandon. Entomologist, Dominion Government Department of Agriculture, in charge of the laboratory and of entomological research in Manitoba. Married. One boy.

CANTOR, Max, M.D.—Associate Professor of Biochemistry, University of Alberta, Edmonton. Will be married by the time this goes to press.

FERGUSON, Marion—201 Walnut St., Winnipeg. Biochemist at Winnipeg General Hospital, work consisting of blood analysis, basal metabolism, etc.

FINN, Donovan B., M.Sc. (Man.), Ph. D. (Cantab.)—188 South St., Halifax. Director, Atlantic Fisheries Experimental Station, Biological Board of Canada, in charge of all research. Married. One daughter.

FLEMING, Allan, M.Sc., M.D. (McGill '33)—Private practitioner and also staff doctor to Canadian Industries Limited, McMasterville, Que. Married.

GREENBERG, A. B., M.D. (Man.)—Believed to be practising in Manitoba.

GREER, Leonard, M.Sc. (Wis.), Ph.D. (Wis.) —209 Canora St., Winnipeg. Geologist in charge of operations at Gold Lake Mines Ltd. in Rice Lake area, Man.

HOLLAND, T. Edward, M.D. (Man.) F.R.C.S. (Edin.)—450 Oxford St., Winnipeg. Physician and surgeon at 320 Medical Arts Bldg. Married. One daughter.

HOLLENBERG, Abraham, M.D. (Man.)—372 Montrose St., Winnipeg. Physician and surgeon at 702 Boyd Bldg.

HOLLENBERG, Michael S., M.D. (Man.)—310 Anderson Ave., Winnipeg. Physician and Surgeon at 702 Boyd Bldg.

JACKSON, V. W., M.S. (Minn. '23)—737 McMillan Ave., Winnipeg. Assistant Professor of Zoology, University of Manitoba, in charge of Zoology II and Eugenics and Genetics III. Engaged in the study of the vertebrate fauna of Manitoba. Married. Two children, Jean and Vincent, Jr.

LOCKSHIN, Nathan—421 Atlantic St., Winnipeg. Assistant Manager, Purity Ice Cream, Ltd., in charge of plant and production. Married One daughter, eight years old, and one brand new boy.

MACDONALD, Pat A., Ph. D. (McGill)—241 Overdale St., Winnipeg. In charge of the radium plant, Cancer Control Board of Manitoba. Married.

MAYNARD, James E.—1056 Lancaster Ave., Syracuse, N.Y. Professor of Geology, Syracuse University, lecturing in Mineralogy, Petrography and Economic Geology and conducting research in Petrography. Married. Two daughters.

McDOUGALL, Dougald — 279 Inglewood St. St. James. Assistant Professor of Pharmacy and Pharmaceutical Chemistry, University of Man. Married. Two daughters.

McLACHLAN, Edith, B.A. (Man.) — 65 Balmoral Place, Winnipeg. Assistant Director of Correspondence Courses, Department of Education, Manitoba Government.

MORTON, Janet G.—St. James Collegiate Institute, St. James.

SWARTZMAN, Ed.—Chemical Engineer, Fuel Research Laboratories, Fuel Testing Division, Mines Branch, Department of Mines, Ottawa.

WATSON, Herbert A., (M. Sc. '29) — 246 Scotia St., Winnipeg. Dominion Analyst, Food and Drugs Division, Department of Pensions and National Health, in charge of the administration of the Food and Drug and other related statutes in the Prairie Provinces. Married. Two children, a boy and a girl.

ZASLAVSKY, Maurice (M. A. Angelle) — Attorney-at-law, 608 Paris Bldg., Winnipeg. Married. One daughter.

1925

BERE, Ruby—Received her Ph.D. from the University of Wisconsin this year, visited for three months in Europe and Palestine. She has been in Winnipeg recently with her family. Was working this summer with the Biological Survey of the New York Conservation Dept. Leaving for California soon.

BIRSE, D. J., M.Sc. (Man. '26)—609 Agnes St. Winnipeg.. In private mine exploration and development work, principally in Northern Man. Married.

BLAIR, Harry, M.Sc. (Man. '27), Ph.D. (Princeton '30)—78 Westland Ave., Rochester, N.Y. (Brighton P.O.). Physiologist, Department of Physiology, University of Rochester Medical School, instructing and conducting research into nerve physiology.

CAMERON, Frank P., B.A., M.D.—Surgeon at Ignace, Ont. Married in 1936.

CHILDERHOSE, Allan J.—Geologist, Texas Company, Houston, Texas. Married.

FRASER, Horace J.—California Institute of Technology, Pasadena. Asst. Professor of Geology.

GOODEVE, Charles F., D.Sc. — 74 Antrim Mansions, London, NW 3, England. Lecturer and head of the Department of Physical Chemistry, Sir William Ramsay Laboratories, University College, University of London, Gower St., WC 1. Married to Janet Wallace, Sc. '29. A small son, Peter Julian.

HUTT, G. McL., M.Sc. (McGill '31) — 1241 Wellington Crescent, Winnipeg. Assistant Development Commissioner, Canadian Pacific Railway, in charge of western activities. Married.

JICKLING, James G.—Teaching at Punnichy, Sask.

McCULLAGH, D. Roy, Ph.D. (Cantab.)—2033 Cornell Rd., Cleveland, Ohio. Biochemist, Cleveland Clinic Foundation, 2040 East 93rd St. Engaged in research. Married. One daughter.

REID, Roger, M.D. (Man.)—Since May 1st, 1936, engaged in practise of medicine and surgery at Truxton, near Syracuse, N.Y.

SAMSON, Edward W., M.Sc. (Man.), M.A. (Toronto), Ph.D. (Princeton '32) — Research physicist, engaged in paper research for Hammermill Paper Company, Erie, Pa.

SAUNDERS, Clifford G. — No recent news. Thought to be teaching at Fairfax, Man.

WARD, George W., M.Sc. (Man. '26), Ph.D. (Minn. '28)—6827 Lakewood Ave., Chicago. Chief Chemist and Geologist, Portland Cement Association, 33 West Grand Ave. Married. Visited Winnipeg during the summer of 1936.

WEBB, John B , M Sc. '30—514 Beresford Ave. Winnipeg. Geologist for U.S. Smelting ,Refining and Mining Company, Boston, Mass. Summer headquarters for 1936 was Amos, Que. Married.

1926

ARCHIBALD, Donald C.—Dominion Government Meteorological Office, 315 Bloor St., W. Toronto. Spent part of 1936 in Gaspè and Newfoundland. Is reported to be quite a linguist, speaking French fluently, some German, and can say yes and no in Norwegian.

ARMSTRONG, Ida M., M.D.—344 Yale Ave., Winnipeg.

BABB, Ralph C. — 103 Rose St., Winnipeg. Teaching.

BROCKLESBY, Horace N., M.Sc. (Man. '27), Ph.D. (McGill), I.C. — 408 Fourth Ave. East, Prince Rupert. Chief Chemist, Pacific Fisheries Experimental Station, Biological Board of Canada. Married. Two children, twins, a boy and a girl, age seven.

BULMAN, Dorothy M., M.A. (Columbia '27)—139 Middlegate, Winnipeg. Medical technician for Drs. W. F. and A. C. Abbott, Power Bldg.

CALMAN, Max, M.Sc. (Mich.)—99 Brosseau St., Ville La Salle, Que. Believed to be chemist in an alcohol firm.

CAMERON, Grace I. (Mrs. Newton D. Schell), B.A.—189 Huron St., Toronto. Married in 1936 to a graduate of Toronto University. Visited Winnipeg in 1936.

CLARK, Leonard B., M.A., Ph.D.—Assistant Professor of Biology, Union College, Schenectady, N.Y. Married. Two daughters.

CLARK, V. Glen—Teaching in St. James Collegiate, St. James. Married in 1936.

COTSIVMAN, Alexander — No recent news. Last heard of in Edmonton.

CRAIGIE, Albert—Teaching at High School, Glace Bay, N.S. This probably establishes his claim to being the first Manitoba graduate to know the meaning of the word draegerman. Married. No children. 25 Reserve St., Glace Bay.

FALLIS, Edgar—Teaching at Machray School.

FOREMAN, Fred—Assistant Professor of Geology, Oberlin College, Oberlin, Ohio.

GILBART, K. C., B.A. (Man.), M.Sc. (Alta.) —Industrial Research Laboratories, University of Alberta, Edmonton. Research on Classification and Coking of Coal. Married. One daughter.

GILBERT, Alberta (Mrs. Russell Clarke) — Regina. One daughter, age two. Spent summer of 1936 at Keewatin.

JOHNSON, Helgi, Ph.D. (Toronto)—5 Cedar Ave., Highland Park, N.J. Assistant Professor of Geology, Rutgers University. Married.

McDOUGAL, K. Grant—2470 Tola Ave., Altadena, Calif. Landscape gardener. Married. One daughter.

McEACHERN, Colin M.—175 Parkview St., St. James. Electric Meter Department, Winnipeg Electric Company.

McEWEN, D. Sanger, B.A. (Man.), M.D. (Man.) — Chest Specialist, Assistant Superintendent, St. Boniface Sanitorium, St. Vital.

NEWELL, Arden—Teacher in Winnipeg.

PETERS, Henry Boyd, B.A.—Obtained M.Sc. in 1936. He is teaching at the Machray School.

RIDDELL, William, B.A. (Man.), M.Sc. (Sask.), Ph.D. (Stanford)— Assistant Chemist, Pacific Fisheries Experimental Station, Prince Rupert. Married.

SIGURDSSON, Stefanie—492 Dominion St., Winnipeg.

WALTON, Charles H. A., M.Sc. (Man. '28), M.D. (Man. '32)—651 Henderson Highway, East Kildonan. Physician, 215 Medical Arts Bldg., Winnipeg. Assistant Physician on the Honorary Attending Staff, Winnipeg General Hospital. Demonstrator in Medicine and Anatomy in the Faculty of Medicine. Married.

ZEAVIN, Samuel—Believed to be in Edmonton.

1927

ANDERSON, Hazel E. — Teaching Physical Training at Delta Collegiate, Hamilton.

BAJKOV, A.—Winnipeg.

COKE, Eugene C., M.Sc. (Man.), M.A. (Toronto), A.I.C., F.C.I.C., Fellow, American Association for the Advancement of Science — Research Fellow, Department of Textile Research, Leeds University, Leeds, England. Single.

DOCTOROFF, Samuel — Teaching Science and Mathematics at Glenboro Collegiate, Glenboro, Man. Married. One daughter, age five.

HIEBERT, Rudolph W.—Consulting geologist, Winnipeg. Single.

HOPKINS, Lyle D.—In charge of highway work, Manitoba Good Roads Board, Winnipeg.

McCARTNEY, Garnet C., Ph.D. (Wis.)—Believed to be engaged in mining in Quebec.

MATHESON, Archie F., M.A. (Queen's), Ph.D. (Minn.)—Geologist with Oro Plata Mining Co., Ltd., Oklend P.O., via Geraldton, Ont. Married.

MONKMAN, Lois (Mrs. F. Burwell Gardner) —Believed to be living near Milton, Ont.

MOYSE, John—Believed to be on the staff of a hospital in London, England.

QUINN, Reay P.—Research Chemist, X-Ray and Surgical Supply Company, Ltd., 93½ Church St., Toronto. Married. Two children.

SIMARD, Lionel — Geologist, Dome Mines. Dome Club, South Porcupine, Ont. Single.

STEIN, Norman, O., Ph.D. (London) — 60 Holly Road, Quinton, Birmingham, England. Assistant Manager of a large chemical plant. Married.

TAYLOR, Vernon—Assistant Engineer, Petroleum and Natural Gas Division, Department of Lands and Mines, Province of Alberta, Black Diamond, Alta. Working chiefly in Turner Valley. Married.

WHITE, Arthur, R.V., M.D., C.M. (McGill '32) —Physician at Stanstead, Que.

WRIGHT, Lewis M.—With the Retail Credit Co. in Edmonton.

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